DOCUMENT RESUME

ED 347 039 RC 018 752

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TITLE Empowering Teachers through Technology: Developing the Rural School of the 21st Century.
PUB DATE Apr 92
NOTE 34p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, April 20-24, 1992).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141) -- Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Achievement; Community Attitudes; Curriculum Development; *Educational Change; Educational Innovation; *Educational Technology; Elementary Secondary Education; Program Descriptions; *Program Evaluation; *Rural Schools; *School Districts; Small Schools; Teacher Attitudes
IDENTIFIERS *Empowerment; Washington

ABSTRACT

This paper describes Colton School District's (Washington) project of the Rural School of the 21st Century. The goals of the 6-year project, initiated in 1988, were to incorporate technology into all aspects of education and to use technology in restructuring the school system. The Colton School District consists of 184 students in a single K-12 building. Empowering or educating teachers with new technology also meant empowering the school board members, parents, patrons, and senior citizens; empowerment and development activities for each group are described. Specific results of the project evaluation for 1992 are included. This report concludes that: (1) teacher attitudes improved toward the use of technology and toward the teaching profession; (2) student achievement increased as measured by the number of books and reference materials checked out by students from the library and an increase in the quality of student writing; (3) technology expanded course offerings of the school; (4) empowerment increased communication between staff, parents, school board members and other groups; (5) through the use of technology and the resulting curricular changes a life-long learning culture was established in the school; (6) additional, compensated professional development time for teachers was established; (7) start-up costs for technological innovation were considered minimal; (8) parent and patron attitudes about the school improved; and (9) teachers thought technological innovation had significantly changed the curriculum, teaching methodologies, and the roles between teachers and students. (28 references) (LP)

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ED347039

American Educational Research Association
Annual Meeting: A Paper Presentation
San Francisco, April 20-14, 1992

Empowering Teachers through Technology: Developing The Rural School of the 21st Century

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Introduction

In the fall of 1987 the staff and school board of the Colton School District initiated a project to transform the District into the Rural School of the 21st Century. The project was developed to address problems associated with small size, geographic location, and educating a growing population of at-risk students. The major vehicle of the project was the development and implementation of a grant proposal for Washington State's Schools for the 21st Century Program. The principal focus of the project was technological innovation, immersing the entire district in the latest technological resources. Several other grants and corporate donations were received by the district over the next several years which were incorporated into the project. The project is now in its fifth year of implementation.

The purpose of this paper is to describe the change processes and strategies that were developed and implemented and to report project results. Given the dynamic, multifaceted nature and turbulent reality of the change process, reporting all the processes used and the results will be difficult.[1] The District staff discovered that various aspects of the school system are indeed interconnected, and changing one facet of the District involved or precipitated changing several others. This paper will attempt to address all the change processes and areas.

The Grant Development Process

On June 8, 1988 the Washington State Board of Education selected twenty-one schools and school district projects to be awarded funding for the Schools for the 21st Century Program. The Colton School District's proposal, *Age of Miracle and Wonder: The Rural*

[1] See (Briggs & Peat, 1989; Gleick, 1987; Peters, 1987; Senge, 1990)

School of the 21st Century, was one of those selected.[2] Highlights and milestones of the nine month grant development process were as follows:

1. October: The teachers unanimously voted to become personally involved in the project. (The choice of different levels of involvement was provided from the entry level of bringing technology into just one area of the teacher's classroom, to higher levels of serving as a staff trainer and serving on the steering committee.) The faculty members were also told that technology was not a panacea and that it would cause more problems at the onset than it would solve.

2. November: After the teachers committed to the project, the Board of Directors made it their Number ONE goal for the next five years.

3. December: The administration completed the literature search, review, and summation as background for the project, particularly on the use of technology in rural schools.

4. March: The school board put a separate special levy to purchase technology before voters and they passed it by a wide margin.

5. April: The proposal and script for the video to accompany the proposal were written by the administration and the video shot and edited by a Washington State University graduate student. Both were submitted to the Governor's Task Force for Schools for the 21st Century for review.

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[2] The name for the project comes from one of Paul Simon's songs in his *Graceland* album were he sings about the *Age of Miracle and Wonder , staccato signals of constant information,* and *lasers in the jungle somewhere*. The provision of technology in the hinterlands is the basic premise of the project.

6. May: Colton Teachers, school board members, and administrators and university, education service district, and education lab personnel interviewed with the Governor's Task Force as one of the 31 finalist projects.

7. June: The Governor's Task Force recommended the project for funding to the State Board who approved it on June 8th.

Project Goals

The overall goals of the project are to:

1. Give all students a technological advantage. (Not just the AP level students.)
2. Improve student achievement and thinking skills.
3. Renew and improve our curriculum and teaching skills.
4. Re-tool the educational program. (*If one changes the tools, does one change the system?*)
5. Develop a model, technologically-advanced school district (*a showcase for the possible*) to assist other districts in the general restructuring of public education.
6. Use technology as an everyday working tool -- everyone in the school.
7. Incorporate technology into the curriculum at all levels and into every subject possible.
8. Once technology has been incorporated to begin to answer the questions:
   - What does technology change about how teachers teach and how students learn?
   - Does technology allow or require the changing of other structures in the school such as:
     - Length of school day, week, or year?
     - Sequence of courses or length of courses?

Project Objectives

The project was conceptualized into two distinct phases of three years each for the six years of funding to be provided by the Washington legislature.

Phase I

During the first three years of the project the goals were:

- To have all staff use technology as an everyday working tool.
- To incorporate technology into the curriculum at all levels and into every subject possible.

Phase II

During the last three years of the project the staff would then address the following questions:

Once technology becomes a working tool for everyone, does it allow or require changes in other structures such as:

- Length of school day, week, or year?
- Sequence of courses or length of courses (mini-units, etc.?)

Why Technology Was Selected

The District selected technology as the key element in restructuring the District and in creating the Rural School of the 21st Century based on a review of the literature. The rationale was as follows:

1. All educational reform reports since a Nation At Risk listed technological change as an area for restructuring.

2. Technology was reported to hold the most promise for revitalizing and perhaps saving rural education in developed countries (Barker, 1985; Barker, 1986a; Barker, 1986b; Barker, 1986c; Barker, 1986d; Batey & Cowell, 1986; Enochs, 1985; Gardner, 1985; Hobbs, 1985; Karon, 1985; Kissock, 1985; Nelson & Hegg, 1987; Nytes & Musegades, 1985; Siegmund & McFadden, 1985; Thurston & Clauss, 1985; Wall, 1986).

3. As predicted in *Future Shock* and *MegaTrends*, technology addresses the three main problems of rural schools: Location, Distance and Size (Barker, 1985; Barker, 1986b; Barker, 1986c; Batey & Cowell, 1986; Kissock, 1985; Marshall, 1986).

4. The staff and community saw the importance of technology for students and their futures. (The staff made individual commitments to be involved and the voters passed the special levy for technology.)

5. The District staff and patrons took at face value claims that the world (and the business world in particular) was in the midst of a technological transformation. They made the decision to have their students educated using advanced technological tools, therefore giving them an advantage.

> "We are indeed in the early stages of a major technological transformation, one that is far more sweeping than the most ecstatic of the 'futurologists' yet realize, greater even than *Megatrends* or *Future Shock*. (Drucker, 1986)."

Colton School District Demographic Information

The Colton School District demographic information is as follows:

General School District:

Students = 184 in single K-12 building

Teachers = 16 for 13.63 FTE (K-12)

Administrators = 2 (Principal and Superintendent)

Communities = 2 (Colton and Uniontown and surrounding Rural area)

Population = 1064 with 576 registered voters

Annual Budget = $7,985 per student (figure includes grants)

Location = 15 miles from Moscow, Lewiston/Clarkston, and Pullman

Economy = Wheat and Dry Pea Farming and Higher Education

Teaching Staff:

Average age of teachers in 1992 = 42 years old

Average number of years teaching in 1992 = 14 years

(The range is from 22 to 5 years with the median being 15.)

Gender = 66% female

Staff turnover during four years of project was minimal as only one teacher left and was replaced. The position was a secondary position and the new teacher was hired at the elementary level in order to reduce student PTR at the elementary level and to focus on increasing number of at-risk students in the elementary grade levels.

Students:

% of At-Risk Students = 49%

% of Students from **Single Parent or Blended Families** = 42%

% of Students from **low socioeconomic backgrounds** = 36% * [3]

% of Students going on to **college after graduation** (last 5 years) = 93%

Drop-out rate of last 20 years = a tenth of one percent

Processes, Strategies, and Related Results

The various strategies for change that were incorporated by the project are described and perhaps best organized and understood from the District's staff's perspective under the heading of *Empowerment.* Discussion is also provided on the rationale for strategies and/or the perceived results.

Empowerment: An Interconnected Strategy

As stated in the introduction of this paper, the District staff discovered that various aspects of the school system were indeed interconnected and changing one facet of the District involved or precipitated changing several others. For example, micro-computers were introduced in each elementary classroom and an elementary computer laboratory was established. This necessitated an extensive staff development program to teach teachers the basics of computing and how it might be integrated into their classroom and curricula. However, parents began to have a number of questions about these *computers* and many had the impression that "kids in America don't know their basic skills, because all they have to do is punch a button on the computer to get the answer." Parents started to complain to board members. In response, the elementary staff and the administration devised a parent development and education program to demonstrate to parents that computers were being used as tools and not as beep-beep game machines. Without the parent development plan, the staff

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[3] In 1980 this figure was 3%. In the last decade population from the farming sector has declined and urban poor have moved into the area to take advantage of much cheaper housing costs in the area. This is a trend in all districts in the area.

recognized that the innovation and immersion of technology could be squelched by parent opinion and fears, rather than informed decision-making.

As an other example, several new members were elected to the school board after the project was initiated. These new board members had the same perceptions that elementary parents had and wanted to know what the District was getting from all this time, money, and energy on computers and other technologies. Consequently, students and teachers made presentations at every regular monthly board meeting for an entire year about school programs, curriculum, and the use of technology in the classroom. Board members also attended state level workshops on technology and participated in the presentations that District staff made about the District's technological innovations at school board and school administrator state conferences.

Consequently, empowering teachers with new technology and therefore extensive staff development also meant empowering and developing the school board, parents, patrons, and senior citizens. Power is always shared (Kantor, 1977; Salancik & Pfeffer, 1977). Empowering and developing one group also means empowering and developing their "partners" or eventually the partners will abolish the innovation. This is particularly confusing since the voters passed the special levy to purchase the technology at the onset of the project and yet needed to have first-hand development/educational opportunities in order to understand what they had voted to provide. They knew they wanted more technology for the students in the school based on the changes they had seen in the society and business, but they did not understand what that meant in classrooms or in the curriculum. They did not understand computer technology in general and they did not understand computers in the context of schooling. They did not have computers in their classroom when they were students. Thus they did not have a personal frame of reference to compare this new innovation with their own school experience.

Each group in the District therefore had a specific set of devised activities that were developed and provided to empower each groups. These development activities are described in the following section.

School Board Empowerment/Development Activities

- Set annual and long-range goals
- Conducted annual board retreats
- Attended annual school board association workshops
- Became involved at the state level in the school board association
- Participated in presentations about Colton's 21st Century project at state conferences
- Made room on board agenda for teacher/student presentations at board meetings
- Traveled to other districts (with staff) to review other innovation projects
- Attended teacher technology training activities locally and at conferences
- Developed a strategic plan for the District including:
    - Mission and Vision Statements
    - Long-term goals in every area of district
- Stayed focused on their original goal of developing the Rural School of the 21st Century

Parent and Patron Empowerment/Development Activities

- Voted to provide special levy monies for technology
- Continued to pass regular levies at over 80% approval rates[4]
- Community volunteers completed Grounds Projects[5]

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[4] The highest approval rates in the history of the district occurred during the five years of this project with levies passing with over 80% approval and up as high as 88%. The highest rate in the history of the district prior to the project was 72%.

[5] The Disturct administration recognized that the appearance of the facility from most patron's perception was very important. What patrons saw when they drove by often formed much of their impressions about what was happening inside the building. The board therefore authorized expenditures to move and remodel the elementary playground and

- Monthly District newsletters focused on change and technology
- All parent meetings and Open-houses focused on change and technology
- Elementary Parent/Student/Teacher Computer Night was held once a month for a year
- Adult Computer Education
    - District staff trained over 40% of adult population on computers at night
    - District staff provided access to technology and technical assistance and services in the form of open computer lab nights and specific assistance to farmers and business people about computers and software.[6]

Staff Empowerment/Development Activities

- Individual Staff Commitment at the Onset of the Project
    - Different Levels
    - Established and legitimized the skunk-works concept

The administration asked the faculty to consider making a personal commitment before the grant was written. If the secret ballot vote was 100% then the grant process would continue. All teachers had to be willing to commit to the basic level of participation which was to bring technology into just one area or subject of her/his classroom. Other levels included being willing to be a staff trainer on specific software or hardware and train other teachers in their use. This initial commitment strategy was based administration's philosophy that effective innovation must have teacher classroom level commitment from the onset, or the project should not be initiated.

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the baseball athletic field. Patron volunteers contributed time and energy, saving tens of thousands of dollars and involving patrons with the District and District staff.

[6] District administration kept asking the question, what can the District provide as a service to patrons in conjunction with the mission of the school district. If the school belongs to all the community, what can the District provide to patrons, especially senior citizens, where they personally benefit from the school. Evening computer classes included a number or senior citizens.

The administration also purposefully established the skunk-works concept used in the business world (Drucker, 1985; Peters, 1987). The higher levels of teacher project commitment stated that the teacher would be willing to be the first on the faculty to receive new hardware and software. In exchange for this they would learn to use the new technology, and then be willing to provide workshop training and daily trouble-shooting services to other staff members. This proved invaluable later in the project in the local school. One of the factors that often kills computer innovation is the teacher being stuck on a particular program or screen and not knowing how to get out of it and then giving up in frustration as their day is already hectic enough. On a regional and national scale Colton teachers have also made presentations about their skunk-works projects to many other teachers and groups in the Northwest states and across the country and have received honorarium fees for their efforts.

Increase in In-service/Development Time

The District board increased the number of half-days of school from nine to twelve per year. Students are released before lunch for the day so the staff can conduct in-service all afternoon. In addition, one of the requirements of the 21st Century Grant Program was that teachers involved in the projects would have to have 10 additional days of service beyond the regular 180 day school year. The staff skunk-works experts provided much of the needed in-service to the rest of the staff during these additional in-service days. As noted in the section below, the faculty and individual teachers devised their own plans for the use of these in-service days.

These ten days were a mere token for most of the staff as they put in countless hours beyond the ten day commitment to implement technological innovation. Having these additional in-service days were identified as one of the key factors to the success of the project.

Self-designed personal development plans - *Go with Your Bliss*

From personal experience the administration had learned that successful technological adoption necessitated a personal need and reason for taking the time to learn the technology and that each person had to find that personal reason and motivation. Consequently, each individual teacher developed a plan for **their** ten extra days. Each teacher set their own staff development goals for what they wanted to learn to bring technology into their classroom. Therefore, instead of the District administration taking over and providing everyone with workshops on AppleWorks, where everyone marched through the same program (and off into the sunset), each staff member was responsible for selecting which technology or software they were excited about bringing into their classroom. They then devised their own plans to meet their goals. (The "Go with Your Bliss" concept came from Bill Moyers' Public Television Series with author Joseph Campbell (Campbell & Moyers, 1988).)

Some staff members formed groups and asked that specific training programs be provided while other selected individual projects (such as learning, HyperCard). This process empowered teachers as individuals in charge of the own personal professional development. In addition, all staff development activities have been turned over to a committee elected by the teachers in the last year. This committee now decides on and plans the in-service program for the staff. .

Staff Empowered Decision-Making

Besides directing staff development decisions, the faculty also elect a technology committee who now make all decisions about what technologies, software, and so forth are to be purchased for the District, where equipment is allocated, and how it is distributed. This committee attends several computer conferences and training sessions and they visit

other innovative schools to stay current in the field. Administrators are elected by the faculty and serve on all committees. For a committee of five, one administrator is elected to serve.

Site-based management training was also identified as being needed in the near future to maximize the staff decision-making process. All this communication has complicated staff interactions and has necessitated staff training in interpersonal communications as will be noted later in the paper.

Technological Empowerment and Skill Development

- Skunk Works (Demonstration sites) versus Equity between classrooms

This project was developed on the concept that Equity between classrooms (how many computers and how much technology was available in each room) was important over the long term but that **INEQUITY was a necessity** for success in the beginning of the project and for long-term staff development in technology.

As mentioned earlier, different levels of staff involvement were established in the initial proposal to the teachers. These self-selected teacher experts received the first technology purchases and the most hardware and software and thereby would be able to (and had agreed to provide) in-service to the rest of the staff, as well as daily trouble-shooting.

The administration believed that the *pancake* philosophy of technological equity, where a District divides the money and other resources up equally between every classroom (or schools), was a mistake as it ended up with equipment and software being use ineffectively or simply gathering dust. After the skunk-works teacher expert learned the hardware/software over time, she/he could present it to the rest of the faculty and train those who wished to use it. By that time financial resources could be acquired by the administration to spread the innovation to more classrooms. The staff also discovered by experience that it was very important that any new technology that was to be adopted had to be readily available to teachers, if not in their room, before they successfully learned and

implemented it in their classrooms. Training without access and regular use was a necessity in developing technology literate and well-trained teachers.[7]

- **Efforts to avoid "On-Crowd and Out-Crowd" School Culture**

Inequity also can lead to a classism in the faculty that can often be destructive and prevent the adoption of an innovation by those late-adopters who are reacting to the social situation instead of the merits of the innovation (Barker, 1992). This problem was identified in the survey responses and by the on-site third party interviews. In response, the administration took specific steps to include all those who were reluctant to move very fast in adopting the new technologies. The late-adopters were specially included on travel to 21st Century functions and presentations. Faculty discussions were held where administrators specifically discussed that everyone had to right to be where they were at in the adoption process. The philosophy was based on the concept that attraction works better than promotion or at worst, coercion.

Increases in Communication and Empowerment: Technology Drove Communication and Empowerment and Created New Challenges

Technological innovation forced an increase in communication in many ways. The following section will describe some of the activities and changes in communication necessitated by technological change.

- **Out from Behind Closed Doors**

The District administration wrote a Chapter II grant titled, "Out from Behind Closed Doors." The major premise of the grant was that teachers live in a very isolated world as

[7] This process also took TIME. The progress was slow in that the first year progress seemed slow. Teacher competancy in technology was remarkable after the second and third years of the project.

closed doors to the classroom and the constant necessity of student contact, often isolated teachers from each other and administration. The grant proposed the establishment of a teacher computer network with Electronic Mail capability. The grant was funded and the network installed in the summer of 1990. The computer network has increased teacher communication a thousand fold as messages are sent daily announcing birthdays and staff meetings, sending personal communications and notes, articles for the District Newsletter, the daily lunch count, and jokes. Everyone now has access to everyone else in the building. Interestingly enough the late-adopters of technology are the staff members who tend to use the E-mail the most.

- **Life-long Learner School Culture Developed- A Change in Roles between Teachers and Students**

No one person can know all there is to know about technology. That humbling factor opened the doors to what the teachers recognized as a *learning community*. Elementary teachers were running to secondary teachers' classrooms asking for help. Students were teaching teachers and each other how to use hardware and software. It legitimized the concept that everyone is learning all the time. Students remarked that they now saw their teachers as learners too, instead of knowledge dispensers. Classrooms gradually became places where knowledge was created and not just dispensed. A new atmosphere of excitement, an excitement for learning, was perceived by visitors to the school who commented numerous times on it.

As an additional result, across grade and across content area communication between teachers and students increased. Currently the District has many have across grade and across content area student learning projects and team teaching projects. These projects are beginning to have an impact on curriculum and curriculum content.

- **Increased contact with teachers and students from other schools in region and around the world**

Over 1,500 teachers, administrators, board members, legislators, university faculty, and parents have visited the Colton school in last 5 years to see the technology program, most came from the five Northwest state but some from as far away as Vermont. With so many visitors the staff decided to hold one visitation day per month and rearrange the schedule to permit visitors to see presentations by teachers and get answers to questions.

Teachers have also visited other schools in the Northwest traveling to collect good ideas and new concepts. Every staff member has been on such a visitation. Staff members have presented to conferences in the region and nationally. They have presented to over 50,000 people in the last five years.

The school also has access to other sister schools and students around the world right from each teacher's desk through the computer network. This has increased contact with other teachers, students, cultures, and world views.

- **Increases in Communication and Empowerment Increase Chance for and Occurrence of Conflict**

With teachers communicating more with each other and administrators, it is only natural to assume that human conflict would increase. In the past, it was easier for teachers to simply close their doors and teach and not have to deal with each other and certainly work together so closely to address meaningful problems and make real decisions that require divulging personal opinions, biases, and emotions. The increase in contact increased the possibility of interpersonal conflict. The staff found the need to hold separate workshops on interpersonal communication and conflict management in order to address these new problems created by increased social contact and communication.

The increase in real decision-making authority also meant that people would have to learn to disagree agreeably over sometimes emotional issues and decisions. Learning how to communicate in constructive and not destructive ways also became a necessity. The administration coined a term for this called developing a *risk-reduced environment* where people feel safe to disagree with each other whether it is the teacher across the hall or the superintendent. Good decisions are based on good communication and that requires that people feel capable of and are interpersonally competent in expressing true feelings and emotions in constructive ways. In addition, a *risk-reduced environment* also meant that teachers and administrators were free to experiment and find better ways -- to also make mistakes.

- **Increased Communication and Empowerment Increased Professional Self-esteem**

Teachers reported that making presentations to local school visitors and to conferences, had a positive impact teacher attitudes about their own professionalism and their attitudes about the school. Sharing their expertise and perspectives gave them a heightened attitude of professionalism. Later in this paper, evaluation information will document increases in teacher attitudes over time about technology and about their jobs and the District.

Results

As part of the 21st Century Grant Program, the District developed a comprehensive evaluation program that included various surveys and third party visitations and interviews. The following has been compiled from the annual 21st Century School Project evaluations.

Budgetary Impacts

In the first 15 months costs for every technology related item including all software, diskettes, satellite dish, computers, and so forth was an additional 5.7% of the total budget. Grants and other soft monies paid for 15% of these purchases. The Special Technology Levy paid for 21% of theses start-up capital costs. Thus, the regular budget picked up 64% of the new costs.[8]

Initial start-up costs	Continued New Adoption Costs for next 4 years
Cost per student = $349	Cost per student = $200

The costs per student have started to decline in the fifth year of the project and are not anticipated to be as high over the next several years. The 21st Century monies will only be available for another two years of the project and the District is currently planning for that eventuality.

Changes in technology in the school over the last five years:

Ratio of Computers per Student/Teacher	1987	1992	
# of Computers per student	1 to 40	1 to 2	*9

[8] Some readers may assume that technological retooling might precipitate cuts in other areas, such as salaries. Teachers received pay raises totaling over 25% during the first four years of the project and are now on the statewide salary schedule. In addition, the board has added to the District's cash reserve in each year of the project.

[9] The number of computers per classroom varies greatly. For example, in English every student has a notebook computer to use and in addition, there are five Macintosh computers for desktop publishing and graphics. Compositions written on the notebooks are transfered electronically into the Macintoshes.

In Math, each student has a hand held graphic calculator for all secondary math. In addition, there are is a Macintosh with a Math co-processor and an Apple IIGS. Students also go to the IBM lab for the MET program and the Apple IIGS lab for Sunburst Geometry programs.

In Science there are five computers with external sensors and many programs that simpulate Physics, Biology, and Chemistry and more. In Music there are a number of computers that teach Music theory and automatically write music that is played on the many electronic keyboards. Students also practice Jazz and Jazz solos against or with the computer which plays it technically correct through the keyboards.

In addition, there are five Macintoshes on carts that act as a floating computer lab. Teachers who are doing projects can schedule the lab into their room for extended periods of time.

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# of Computers per teacher	1 to 20	1.5 to 1 * [10]
# of Computer Projectors per teacher	0	1 to 2
# of Laser Disc & TV per teacher	0	1 to 2
# of CD-ROM Drives per teacher	0	1 to 2
# of LCD Computer Projection Display	0	1 to 2
# of Computer Labs	1	3

Satellite Courses: (All these courses are new since 1987 as the satellite dish was installed in 1988, expanding the District's course offerings.)

Spanish I & II

Japanese I & II

Russian I & II

Calculus

Advanced English

Teacher/Administrator/Board Member In-service Programs (24 per year)

All courses also offer college credit if desired.

Reported Changes in Teacher Attitudes and Information about Technology, the 21st Century Project, Curricular Innovation, and the District in General

Upon searching the literature, the administration found two surveys that were used as a basis for measuring staff attitudes about technology over time (Bannon, Marshall, & Fluegal, 1985; Gressard & Lloyd, 1985). In addition, survey questions were added that collected information about staff attitudes about the 21st Century Project, about curricular innovations,

[10] Each teacher has their own Macintosh computer. All the computers are networked with electronic mail and netmodem access to a giant international information database (DIALOG) and student and schools around the world. Each teacher thus has access (from his or her desk) to literally all the information in the world and to other teachers and students around the world.

and the District in general. These surveys completed by the staff every August prior to school. In addition, board members and patrons were also surveyed periodically in a shorter survey.

Each spring a third party evaluator from the Rural Education Center at Washington State University spent several days on site at the school interviewing each staff member and validating information gathered in the survey process. The following results are reported from those surveys and evaluations.

Questions That Teachers Rated With Highest Agreement:

- *I believe that teaching students to think is one of the most important skills that we can give them for the 21st Century.*
- *Computer skills will be a necessity for students graduating from high school in the next 10 years.*

Questions for which the ratings changed the most from 1987-88 to 1991-92:

- *I am satisfied with the Colton Schools this fall.*
- *I am excited about what is happening with school this fall.*
- *The Colton School District's Rural School of the 21st Century Grant will have a very positive effect on the students, teachers, parents, and communities.*

General Areas Surveyed:

Reviewing the survey data and third party evaluation interviews, the following characteristics were listed in rank order of agreement by the teaching staff:

1. **Positive Attitude Toward the District's Schools for the 21st Century Program**

Teachers felt the most positive about the District's Schools for the 21st Century program than any other area of the questionnaire. Their overall rating of their attitudes about the program also increased in each year of the project.

2. **Positive Attitude Toward Technology**

Teachers' attitudes towards technology and their own reported confidence in their abilities to use computers and technology increased with each year of the project. In addition, they continued to have increasingly positive beliefs about computers and importance of the future of computer technology in schools, the more they reported using computers. They also reported feeling energized by the intellectual stimulation of learning, that learning how to use technology was fun and exciting, and they felt rejuvenated about their jobs. (The Colton Staff is a mature staff. See the demographic data.)

3. **Positive Attitude Toward Colton Schools**

Teachers expressed an increasingly positive attitude about the Colton School District in general during each year of the project. Teacher attitudes about teaching and the district rose the most of all sections of the questionnaire during the project.

4. **Computer Anxiety and Preferences**

The teachers reported a reduction in the anxiety they felt in using computers and an increase in their confidence in using computers during each year of the project.

Changes in Teacher Use of Technology

Teachers who have purchased their own computer for their Home:

1987	1992
only 3 teachers	60% of all staff

Reported they use Computers every day in teaching or job related duties

1987	1992
only 1 teacher	100% of all staff

Seventy percent of the staff are still Considering buying a computer or getting a new computer this next year.

Changes in reported level of Teacher Computer Expertise - How teachers rated themselves as computer users:

	1987	1992
Somewhat of a Computer Expert	0%	62%
An Experienced Computer User	11%	19%
An Intermediate Computer User	6%	19%
An Advanced Beginner	6%	0%
A Complete Novice	77%	0%

Changes in reported level of computer expertise teachers set as a goal for themselves:

	1987
Somewhat of a Computer Expert	16%
An Experienced Computer User	53%

An Intermediate Computer User	11%
An Advanced Beginner	11%
A Complete Novice	11%

Length of Time Colton teachers been using computers in their teaching:

The average length of time that Colton teachers have used computers in their teaching is 4.77 years with 94% of the staff reported only using since the start of the project.

Change in reported teacher use of computers for classroom administration/management in the last school year (1988-89) (Examples: Grading, making up tests, teacher produced classroom materials)

	1987	1992
Computer use for classroom management	17%	100%

Change in whether teachers provided instruction to their students on how to use computers in their classrooms in the last school year (1988-89)?[11]

	1987	1992
Teachers trained students as part of their class	17%	94%

- Teachers reported using more computerized Drill/Practice and Word Processing in most subject areas than the previous year. The area that showed the most pronounced increase was the use of computer graphics/publishing in ALL subject areas.

[11] The District established a focus for technology at the onset of the project. Since word processing is one of those areas that computers have been of most use, all teachers were trained on the writing process, teaching them how to write and how to teach writing regardless of content area or grade level.

- Teachers also reported a most dramatic increases in the use of computers in teaching Writing, Math, Language Arts, and Social Studies from the previous years. In addition, teachers understanding and use of multi-media, CD-ROM, databases, and International communications increased dramatically. (Eighty-eight percent of teachers reported using them in 1992 while only 6% did in 1987.) The evaluation also found that as the equipment was purchased and became more available to teachers, more teachers started to use them.

- Teacher reported training and interest in staff develop workshops in technology matched their use and interest in various applications. For example, teacher staff develop interest in multi-media corresponded with the increased use by colleagues and by immediate hardware and software availability to them.

Comparison of reported changes in the curriculum and teaching methodologies in their classrooms and the curriculum in general during the project.

- One hundred percent of the teachers reported that technology had changed the curriculum in their classrooms during the project.

- One hundred percent of the teachers reported that technology had changed their teaching methods.

Comparison of teacher expectations that technology would change the curriculum and teaching methodologies in their classrooms and the curriculum in general in the future.

- One hundred percent of the teachers anticipated that technology would continue to change the curriculum and teaching methods in their classrooms in future years.

- One hundred percent of the teachers also anticipated that technology would continue to change the curriculum in future years.

- The teacher belief that technology would cause more pronounced changes in education grew during each year of the project. Each year more teachers anticipated that technology was going to have an even greater impact on their classrooms and methods in the next year and on the whole curriculum than they had anticipated the year before. Thus, as teachers became more familiar with and used more technology in their teaching, their belief that technology had and would continue to change teaching outgrew their previous expectations.

Comparison of Higher Order Thinking Skills courses/in-services taken and desired by teachers from 1987-88 to 1991-92.

- As more technology was incorporated the teacher interest in training in Higher Order Thinking Skills also grew. The infusion of technology into teaching might be related to teacher interest in Higher Order thinking skills, however, the possibility of that relationship was not the focus of the evaluation.

Comparison of what teachers thought would change most and least about their teaching as the result of the infusion of technology into the District in the next 6 years.

- Seventy-seven percent of the teachers expressed that they believed that technology was going to move them away from basal texts and workbook drill and practice and empower them and their students to concentrate more on the process of learning.

- Ninety-four percent of the teachers expressed that their love of teaching and the relationship between students and teachers would not be changed much by technology. (As one teacher

put it, technology will never replace a caring, warm, and intelligent human being, an excellent teacher.

Comparison of teacher expectations about what time and organizational (system) structures should be changed to make schools more effective in the future.

- Seventy-seven percent of the teachers believed that their teaching methodologies should be changed.

- Ninety-four percent of the teachers believed that the length of the class periods and the school year should be changed. Most commented that they needed more student contact time, at least in longer segments, and more time to communicate and work together with other teachers. In 1987 only 24% believed that change in this area was needed.

- As the project progressed, teacher belief in the need for change grew from 24% to Ninety-four percent. Teachers became increasing convinced that drastic change is needed in education.

- Teachers also reported an increase in the belief that curriculum sequencing and focus on content areas needed to be changed. Teachers anticipated that an interdisciplinary focus, thematic curriculum, active learning, cooperative learning, team teaching, multi-graded and non-graded systems, and holistic approaches were needed and would become more prevalent. This change increased with each year of the project.

Summary and Conclusions

Teacher Attitudes

During the project teachers reported increasingly positive attitudes about:

- Computer technology in general
- Their own technological knowledge and skill
- The need for technology in the classroom & curriculum
- The District in general
- Teaching as a profession

- The need to drastically change school structures such as the length of class periods, the school day and year, and the curriculum, teaching methods, and the roles of teachers and students
- The need for teaching critical/higher order thinking skills

- The 21st Century project itself and its positive effects on students, teachers, parents, and community patrons

Student Achievement and Non-traditional Student Assessment

Student achievement increased, not as measured by the traditional norm-reference testing, but by the non-traditional methods of the number of books and reference materials checked out by students from the school library, by increases in the quality of student writing as measured by holistic assessment measures, and by action research conducted by regular classroom teachers at all grade levels. [12]

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[12] The teachers realized after the first year of the project that their changes in curriculum, for example, the emphasis on writing would not be measured on the annual state-required standardized tests. They therefore sought other methods to gauge student progress.

Teachers used technology to assess student achievement. Teachers utilized computer technology to develop portfolio assessment materials and to keep daily anecdotal records (action research) on individual student progress, strengths, and needs, and student self-assessment documents.

Teachers became more willing develop and more proficient in using non-traditional assessment techniques such as portfolio assessment during each year of the project.

Curriculum

Technology, particularly satellite technology, expanded the curriculum course offerings of the school. In addition, the curriculum was expanded by cross grade and content area teaching/student projects that were facilitated by technology.

Empowerment and Communication

The staff perceived that empowering/educating one group of the District also necessitated empowering/educating the other groups. Empowering the staff also required educating/empowering parents, patrons, senior citizens, and business people.

Technology and staff empowerment increased staff communication.

Increased staff communication increased staff conflict and the need for interpersonal communication and conflict management skills.

Teachers perceived that technology empowered teachers and students.

School Culture

Shared/participatory democratic school decision-making was perceived as necessitating the development of a *risk-reduced* school culture.

The aspect of technological classism was identified an issue of school culture that was addressed.

Technology and resulting pedagogical and curricular changes were perceived by teachers and students as establishing a Life-long Learning culture in the school.

Teacher Professional Self-esteem

Increased contact with other professionals, making professional presentations, and sharing professional expertise were perceived by the teachers as increasing teacher professional self-esteem.

Staff Development

Additional, compensated professional development time for teachers was perceived as one of the most important factors for successful technological innovation.

Staff development activities proved to be successful and were teacher self-directed.

Budgetary Impact

Start-up costs for technological innovation do not necessarily mean reductions in staff positions or pay increases or the District`s cash reserve.

Parent and Patron Attitudes and Involvement

Parent/patron positive attitudes about the school increased with each year during the project.

Technological Innovation

Technological Equity between classrooms was vital in the long run but Inequality was a necessity at the onset to facilitate skunk-works projects and local staff training capacity. Technological innovation can impact an entire school in a relatively short period of time.

Given enough staff development resources and autonomy, and immediate access to hardware/software, teachers learned to use technology extensively in their teaching in a two to three years.

Technological innovation was perceived by teachers as significantly changing the curriculum, teaching methodologies, and the roles between teachers and students.

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